

The **American Fertilizer**

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JULY 3, 1943

No. 1



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AMMONIUM NITRATE
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SULPHATE of AMMONIA
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ORGANIC AMMONIATES
•
SULPHUR
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See page 25

MENTION "THE AMERICAN FERTILIZER" WHEN WRITING TO ADVERTISERS.

... THE ...

AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

Vol. 99

JULY 3, 1943

No. 1

THE 1943 WAR CONVENTION

Problems of Plant Food Production and Distribution Occupy Entire Program of 19th Annual Meeting. Ammonium Nitrate the Main Topic of General Discussion. H. B. Baylor Elected President for Coming Year.

THE 19th Annual Convention of the National Fertilizer Association will occupy a unique position in the history of the fertilizer industry. It was the first annual meeting of the Association in which the problems of the industry were the only items on the program. "Business only" was the order of the day and the social events—the golf tournaments, the ladies entertainments, even the Annual Dinner—were eliminated "for the duration."

Because of transportation restrictions, it had been urged that the attendance be limited voluntarily and as a result the register was in the neighborhood of 150, rather than the usual 400. Practically all of the key men in the industry were present, however, and the discussions of current problems were most representative of the fertilizer manufacturing viewpoints of today. The convention met this year at the Homestead, Hot Springs, Va., where in 1916 it had held its meeting while World War I occupied the stage.

At the close of the convention, the Board of Directors elected the following officers for the year ending June 1944: President, H. B. Baylor, International Minerals & Chemical Corp., Chicago; Vice-President, Weller Noble, Pacific Guano Co., Berkeley, Cal.; Executive Secretary and Treasurer, Charles J. Brand, Washington, D. C.

The following Directors at Large were nominated and elected for the term ending in June, 1946: M. H. Lockwood, Eastern States Farmers' Exchange, Springfield, Mass.; H. Albert Smith, The Smith Agricultural Chemical Co., Columbus, Ohio; and Louis Ware, International Minerals & Chemical Corp., Chicago. H. B. Baylor, International Minerals & Chemical Corp., Chicago, was

elected to fill a vacancy in the term ending in June, 1945; and Robert S. Cope, The Reliance Fertilizer Co., Savannah, Ga., to fill a vacancy in the term tending in June, 1944.

Directors nominated by the Districts and elected for the full three-year term were: District 1, M. W. Whipple, Olds & Whipple, Inc., Hartford, Conn.; District 2, W. H. Gordon, Chamberlin & Barclay, Inc., Cranbury, N. J.; District 3, Enos Valliant, Dorchester Fertilizer Co., Cambridge, Md.; District 4, F. N. Bridgers, Farmers Cotton Oil Co., Wilson, N. C.; District 6, L. D. Hand, Pelham Phosphate Co., Pelham, Ga.; and District 12, Weller Noble, Pacific Guano Co., Berkeley, Cal. W. H. Waples, Lynden Department Store, Lynden, Wash., was elected to fill a vacancy in District 11 for the term expiring in June, 1944.

The Executive Committee appointed to serve during 1943-44 is as follows:

H. B. Baylor, Chairman; B. H. Brewster, III, F. N. Bridgers, James W. Dean, George W. Gage, M. L. Lockwood, Weller Noble, L. W. Rowell, John E. Sanford.

Session of June 22nd

In opening the convention, President John A. Miller said: "We feel that our industry and our Association have assisted in every possible way the Government's war effort. We have produced and distributed well over 10,000,000 tons of fertilizer in the face of serious manpower and material shortages. In each of our last two conventions we pledged our cooperation to the Government in furthering the war effort. In carrying out these pledges the Association has tried to protect the industry's interests when they did not conflict with the Nation's over-all efforts to

win the war. We are pleased to say that governmental agencies have called upon us freely for such assistance as we have been able to render and have consulted often with members of our staff. They have accepted and used without question data furnished by the Association." President Miller's address is given in full elsewhere in this issue.

The Nitrogen Situation

Edmund Rowland, chief of the Nitrogen Unit, WPB, stated that the nitrogen supply picture for 1943-44 as compared to 1942-43 has changed sharply. There will be (1) an increase in the supply of ammonia and ammonium nitrate from synthetic sources, and (2) a probable decrease in nitrate of soda to conserve shipping. He pointed out that in order to keep nitrogen plants operating at maximum capacity it will be necessary that the products flow evenly into use, as neither ammonia nor ammonium nitrate can be stored in quantity at points of production. "For those manufacturers equipped to use them," he said, "solutions should be the nitrogen material used to the greatest possible extent in mixed goods. For the dry mixer, solid ammonium nitrate must take the place of solutions. In no case should ammonium sulphate be used as the primary source of nitrogen; it should only be used to attain the desired analysis after the maximum amount of solutions or of grained ammonium nitrate has been used."

Mr. Rowland pointed out especially that manufacturers who accept their allocations on schedule and in full will be eligible to purchase additional nitrogen and "will receive more nitrogen over the year than the buyer who merely takes his base allocation, and far more than the buyer who abandons some of his allocation . . . Cal-nitro, uramon, cyanamid for direct application, and nitrate of soda are primarily for direct application and are being reserved for distribution at a later date." Ammonium sulphate will be allocated in proportion to manufacturer's acceptance of solutions or of grained ammonium nitrate, and the remainder will be reserved for allocation as may later prove advisable.

The Phosphate and Potash Situation

Dale C. Kieffer, chief of the Fertilizer Materials Unit, WPB, said in part: "The 1943-44 program envisions a minimum requirement of 6,600,000 tons of ordinary superphosphate (basis 18 per cent). That is 13 per cent more than this country has ever produced before in any fertilizer year. The 1942-

43 year established a record and we expect to better that record by at least 800,000 tons . . . It has developed that something better than 6,600,000 tons can be produced if approximately 500,000 tons of 50 to 55° sulphuric acid can be supplied to acidulators . . . We are anticipating a total production of about 275,000 tons of concentrated superphosphate during 1943-44. The United States is committed to deliver 152,000 tons to the United Kingdom, all of which because of transportation and other difficulties must come from eastern production, leaving only a small amount for the fertilizer industry in the eastern part of the United States. This tonnage will undoubtedly be delivered almost entirely to fertilizer plants in the northeast and is not expected to exceed 1500 tons per month beginning in July." Mr. Kieffer stated that "a superphosphate industry advisory committee consisting of ten members, representing both large and small producers, is being set up."

Speaking of the potash situation, Mr. Kieffer stated that "in 1943-44 we anticipated a production of primary potash equivalent to 700,000 tons of K_2O . During the fertilizer year just prior to the start of the war in Europe, total deliveries of potash in North America, Puerto Rico, Hawaii, and Cuba, amounted to 412,000 tons of K_2O , 206,724 tons or 50 per cent of which came from domestic plants. From an analysis of the requirements for Lend-Lease, for export to Canada and Latin America, for industrial and chemical uses, it appears that there will be 540,000 tons of K_2O for domestic agriculture including Hawaii and Puerto Rico. He stated that the potash allocated for delivery during Period 2 to each fertilizer plant is approximately 81 per cent of the average total purchased during the same period of the two base years (1941-42 and 1942-43). It is expected that 90 per cent of the annual delivery will be provided during the discount period and that 10 per cent can be delivered in the spot season. "In other words," he said, "if you divide the total K_2O allocated to you during Period 2 by 90 and multiply that by 100 you will obtain a figure representing the total quantity that you have reason to expect during the 1943-44 season."

Fertilizer Distribution

The 1943-44 fertilizer distribution program was discussed by William F. Watkins, chief, Requirements Section, Fertilizer Division, War Food Administration. Mr. Watkins reviewed the 1942-43 program and outlined

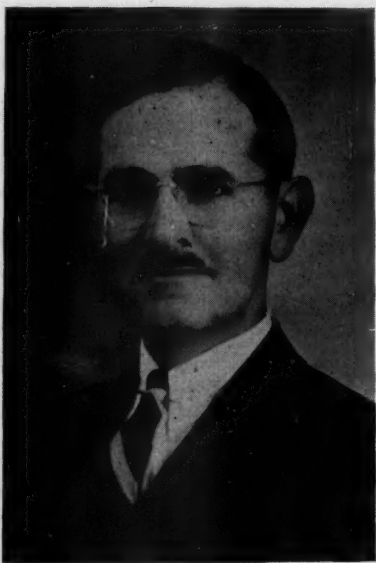
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the provisions of the revised FPO 5 which will be published within a few days. In general, the regulations have been simplified, the requirements liberalized, and the program is being announced at a much earlier date than last year. Grades for the various States have been selected, the supply situation is more positive, and the experience of the past year will be helpful. While the program last year was concerned almost entirely with nitrogen conservation, the program for the coming year and which will be embodied in the new order will be concerned with all three of the principal plantfoods—nitrogen, phosphoric acid, and potash. The grade substitution program has been entirely eliminated, but a simplified application form will be required, crops will be classified into A and B groups in much the same manner as last year, and a similar method of determining crop requirements will be included but the method for determining the requirements of Group B crops will be modified to make new users eligible to buy fertilizer.

The grades for the various States will be practically the same as those published in FERTILIZER War Notes during recent weeks. Victory garden fertilizers will be on a regional basis as follows: 6-10-4 for the Pacific Coast States, 4-12-4 for the Middle Western States, and 5-10-5 for the Atlantic Coast and Southern States. Each fertilizer manufacturer will be permitted to make one grade of specialty fertilizer which may be one of the approved grades or an unapproved grade, but not more than 50 per cent of the nitrogen and potash sold in specialty fertilizers in 1941-42 can be sold in such fertilizers during the next year. Specialty fertilizers must contain a minimum of 16 units of plant food and not more than 25 per cent of water insoluble nitrogen.

Session of June 23rd

Pricing Problems

The first speaker on the Wednesday morning program was Cedric G. Gran, head of the Agricultural Chemicals Section, OPA, who spoke on "Fertilizing Pricing Problems." Mr. Gran said in part: "Remembering in particular the write-off of inventory that took place following the first World War, I am sure you will all agree that the dose of price control, bitter as it seems, is much more preferable than the inflationary binge. First of all," he said, "we cannot see any valid reason as yet for any general increase in prices anywhere along the line. However, certain problems do merit serious considera-

tion." He then discussed in some detail various factors of cost as they relate to nitrate of soda, sulphate of ammonia, nitrogen solutions, organic nitrogen carriers, phosphate rock and superphosphate, potash materials, and mixed fertilizers. In closing, Mr. Gran said: "I just want to say that we will not make any attempt to put into effect a new set of dollars and cents maximum prices without consultation with the industry. We take pride in playing the game in an open, above-board manner, with all the cards face up on the table, and if you think any of our proposed actions are cockeyed, we want you to tell us so. Constructive criticism is especially welcome and particularly when it is bulwarked with facts. We find it very difficult, on the other hand, to do anything based upon flat statements without the factual evidence to back them up. I want to say here that both the Industry Advisory Committee, of which some of you are members, and The National Fertilizer Association have been very helpful to us in making the job of fertilizer price control workable."

Problems in Formulating Fertilizers

Dr. F. W. Parker, chief, division of Soil and Fertilizer Investigations, U. S. Department of Agriculture, discussed "Problems in Formulating Fertilizers for 1943-44." Dr. Parker stated that the formulation problems confronting the industry involve (1) the use of greater quantities of ammonia solutions without excessive reversion of phosphoric acid, (2) storage and handling of solid ammonium nitrate in the plants, and (3) formulation of fertilizers that are not too hygroscopic. The text of Dr. Parker's address, (Dr. Wm. H. Ross is co-author) is printed elsewhere in this issue.

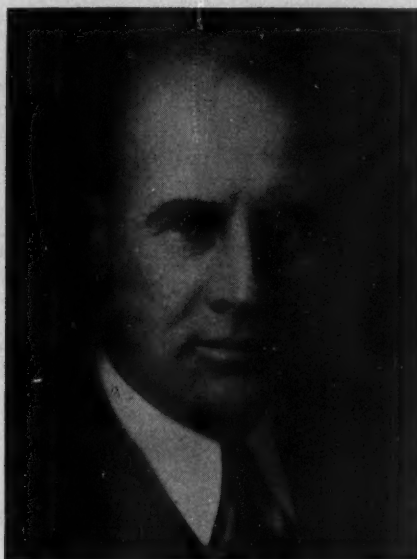
Cottonseed Meal Production Increasing

For the first 10 months of the cotton crop year, from August 1, 1942 to May 31, 1943, the amount of cottonseed crushed at the mills in the United States was 4,344,387 tons an increase of 485,878 tons, or 13 per cent over the same period of the previous crop year. Production of cake and meal totaled 1,924,270 tons, compared with 1,681,702 tons. Shipments during the period, however, were much larger, with the result that stocks on hand on May 31, 1943 were only 36,258 tons, compared with 286,938 tons on May 31, 1942.

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WARTIME WORK OF THE N.F.A.*

By JOHN A. MILLER

President, The National Fertilizer Association

THERE can be little doubt that a slogan to which I referred in last year's address, "Production Will Win the War," is being realized in fact. Food production has proven to be a most significant factor in the achievement that is surely bringing about Axis defeat. It seems probable that a most appropriate slogan for the basis of peace negotiations will be, "Food Will Write the Peace." Only a few weeks ago delegates from all the Allied Nations deliberated at length, within these same walls, over the food problems that will face the world upon the cessation of hostilities, and considered in detail the methods of solving such problems.

We feel that our industry and our Association have assisted in every possible way the Government's war effort. We have produced and distributed well over 10,000,000 tons of fertilizer in the face of serious man-power and material shortages. In each of our last two conventions we pledged our cooperation to the Government in furthering the war effort. In carrying out these pledges the Association has tried to protect the industry's interests when they did not conflict with the Nation's over-all effort to win the war. We are pleased to say that governmental agencies have called upon us freely for such assistance as we have been able to render, have consulted often the members of our staff, and have accepted and used without question data furnished by your Association and its employees.

When, in the opinion of the War Production Board, it became necessary to issue regulations covering the distribution and use of fertilizer, the publication, "American Fertilizer Practices," put out by the Association, the result of our consumer survey in 1938, was one of the chief sources of data used by U. S. Department of Agriculture officials in developing their recommendations to the War Production Board upon which Conservation Order M-231 was based. As the program developed, it appeared to be necessary to discuss the many problems involved with the industry and with State and Government agricultural officials in the field. On request of

the Government, the Association arranged some 40 meetings throughout the country and contributed in no small measure to the better understanding of the various governmental orders covering our industry.

I should like to mention a few other instances which illustrate the Association's activities in connection with the regulatory orders that so vitally affected the operations of all manufacturers of fertilizer.

When the Office of Defense Transportation issued ODT Order No. 18 requiring box cars to be loaded to their maximum carrying capacity, it immediately became apparent that such loading was impractical for fertilizer. A survey by the Association indicated that the safe minimum load was 30 tons, and the facts were placed before ODT by members of our staff and supported by the recommendations of WPB and USDA. This action brought about special consideration of our case and a revision of the order was issued establishing a minimum carload of 30 tons of bagged fertilizer from mixing plants.

No effort was spared to present our case to OPA in an attempt to secure additional gasoline and tires which we felt were and still are necessary for our industry. Many interviews were held with the rationing authorities, but in this instance we were not successful in receiving the relief to which we felt we were entitled. In fact, we received no relief except such as applied to salesmen generally.

We are all familiar with the difficulty encountered in attempting to obtain repair and maintenance supplies under the priority rating of A-10 that was originally provided for our industry. This situation was kept constantly before the officials in charge, and, with the splendid cooperation of the Agricultural Chemicals Unit of the WPB, we were able to obtain a most satisfactory adjustment of the priority situation; and were granted in general a blanket AA-1 priority rating for general repair and maintenance supplies. The members of the industry are the best judges of how valuable this new rating has been to us in our operation during the past season.

With all our application forms, allocations, and raw material and labor shortages, we

* An address at the Annual Convention of the National Fertilizer Association, Hot Springs, Va., June 22, 1943.

have managed to distribute fairly equitably to the farmers of America the largest spring tonnage in the history of our Nation.

There is one question which I wish briefly to discuss in my capacity as a fertilizer manufacturer and entirely separate from the fact that I happen at the moment to be an officer of The National Fertilizer Association. That question is the invasion of the field of private enterprise by direct competition of governmental agencies and instrumentalities. I speak primarily of the distribution of fertilizer and fertilizer materials by the Agricultural Adjustment Administration and the Tennessee Valley Authority, but the principle involved in such distribution is much broader than may be apparent at first glance.

Government Competition

I grant that it is a proper function of Government to carry on research and to develop and demonstrate the effectiveness of new fertilizer materials. I do not grant that it should be necessary, in order to prove or disprove the value of any material, for the Government to furnish some 20,000 tons of it to 40,000 farmers year after year, as the TVA is doing. I submit to you that it would be about as logical for the Government to furnish thousands of tons of Irish potatoes to urban dwellers to prove their nutritive value, as it is to furnish large amounts of superphosphate to farmers in most sections to prove its value as a plant food. I am just as much interested in the farmer as any man, as our small company does business with no one else; and I firmly believe in doing for the farmer whatever is necessary to bring him in balance with the rest of the Nation's economy. I do not believe that it is necessary for the Government to use its enormous purchasing power, its credit, its personnel, and funds raised by taxation, to furnish one and a quarter million tons of fertilizer to farmers at prices below those which well and economically operated commercial enterprises are able to meet, as the AAA did last year. I especially do not believe such a subsidy is desirable or equitable when every dollar the farmer spends for fertilizer returns to him five- or six-fold in crop increase under present fertilizer prices, and the steadily increasing prices received for farm commodities. After all, the large overhead of AAA is paid for by the taxpayer and hence in the long run is borne by consumers generally, instead of by the persons who receive the benefit. This is unjustifiable.

I call your attention to the fact that the AAA distribution of fertilizer, principally

superphosphate, has increased from 67,000 tons in 1938 to 1,195,000 tons in the calendar year 1932; and that its estimated requirements for the 12 months beginning July 1, 1943, are 1,569,000 tons of 18 per cent superphosphate. This, as I understand it, is in the name of conservation, which word seems as out of place in our all-out war effort as a bow and arrow would have been in a Tunisian Campaign. It is only fair to say, in this connection, that the AAA authorities very properly and willingly deferred shipment of their tonnage during this past spring in order that the superphosphate storage for the manufacture of food crops could be relieved, and that they have withdrawn their request for potash for the coming year in the face of an inadequate supply. It is our understanding also that the superphosphate deferred this past spring must be delivered during the next six months.

In the present emergency and with the extreme need for the production of every possible pound of food, feed, and fiber crops, I do not believe it is sound economy to utilize over 20 per cent of our phosphate on so-called conservation crops, not only at the expense of adequate phosphates for food and feed crops, but also at the expense of nitrogen for those crops if such phosphates are diverted from ammoniation and distribution to users by industry. Nitrogen in various solutions and liquors is now available and should be used, and superphosphate stocks are low. The Government is justified in entering into direct competition with private enterprise only if private enterprise fails to produce satisfactorily at a fair and reasonable price. The fertilizer industry has not failed in these responsibilities.

In the face of these facts, which are well-known, a United States Senator in a recent speech on the floor of the Senate, which filled 17 three-column pages of the Congressional Record, advocated the construction and operation, at Government expense, of a large plant in Alabama to produce and distribute more fertilizer by TVA or some other Federal agency. I feel strongly that it is high time our industry individually and collectively file protest in appropriate quarters against such continued and ever-increasing invasion of the field of private industry at the expense of the taxpayer.

The members of the Association and others, because we have not confined our releases to those who pay dues in the Association, are familiar with the assistance we have rendered the Government in disseminating to the

(Continued on page 26)

Problems In Formulating Fertilizers For 1943-44*

By F. W. PARKER and W. H. ROSS

Division of Soil and Fertilizer Investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering,
U. S. Dept. of Agriculture, Washington, D. C.

THE formation problems confronting the fertilizer industry arise from the necessity of using increased quantities of ammonia solutions and ammonium nitrate in the 1943-44 season. As far as the use of these products in mixed fertilizers is concerned, the problem can be considered under three headings: (1) the use of greater quantities of ammonia solutions without excessive reversion of phosphoric acid, (2) the storage and handling of solid ammonium nitrate in the fertilizer plant, and (3) the formulation of fertilizers that are not too hygroscopic.

Before discussing these three topics it may be well to point out that the problems involved in using ammonium nitrate are neither new nor temporary. The fertilizer industry has used large amounts of ammonium nitrate in ammonia solutions and as Cal-Nitro. Fertilizers in which 40 per cent of the nitrogen was derived from ammonium nitrate have been on the market and were used successfully in large tonnage before war shut off the supply of ammonia solutions and Cal-Nitro. Ammonium nitrate is now available for fertilizer purposes from private and war plants. Increased supplies will be available in future years, for ammonium nitrate is the form of nitrogen war plants produce that can be readily used in fertilizer. Its effective use is a problem the industry will face next year and in the years to follow.

Ammonia Solutions

In 1941 the fertilizer industry used 65,000 tons N from ammonia solutions in the manufacture of complete fertilizers. More than 50 per cent of the tonnage was used in four months—November to February—whereas only 16 per cent was used in four summer months. It may be noted that in January, 1941, ammonia solution consumption was at the rate of 168,000 tons N per year. With the background of experience indicated by these consumption figures we may be sure most manufacturers are familiar with the use of

ammonia solutions and can work out their own problems.

Such problems as exist arise from the need for utilizing increased quantities of these solutions. The supply is subject to considerable variation, depending on the capacity of the industry to use the product, but a supply of 100,000 tons N is assured and this may be increased to 125,000 tons or more. It is easier to increase the production of ammonia solutions than that of any other nitrogen fertilizer material. In view of this situation and the several advantages in using ammonia solutions the industry should make every effort to use as large a tonnage as possible.

Recommendations on Use.—Producers of ammonia solutions have well-qualified men in their technical service to advise customers regarding the use of their products. Our first recommendation, therefore, is that this technical service be fully utilized when problems arise relating to the use of these materials.

TABLE 1
RECOMMENDED RATES OF AMMONIATION
Per Cent P_2O_5 from
Superphosphate

Initial storage temperature below 110° F.		
Free NH_3 per ton.....	30 lbs.	36 lbs.
Equivalent Nitrogen Solution		
IIA.....	138 lbs.	166 lbs.
Equivalent Nitrogen Solution		
IV.....	180 lbs.	217 lbs.
Urea-Ammonia Liquor-B.....	98 lbs.	118 lbs.
Initial storage temperature 110° F.—125° F.		
Free NH_3 per ton.....	25 lbs.	30 lbs.
Equivalent Nitrogen Solution		
IIA.....	115 lbs.	138 lbs.
Equivalent Nitrogen Solution		
IV.....	150 lbs.	180 lbs.
Urea-Ammonia Liquor-B.....	82 lbs.	98 lbs.
Initial storage temperature above 125° F.		
Free NH_3 per ton.....	20 lbs.	25 lbs.
Equivalent Nitrogen Solution		
IIA.....	92 lbs.	115 lbs.
Equivalent Nitrogen Solution		
IV.....	120 lbs.	150 lbs.
Urea-Ammonia Liquor-B.....	65 lbs.	82 lbs.

Notes: 1. It is assumed the fertilizer will contain dolomite but no active basic materials such as lime or Cyanamid, that storage will be in large piles which cool slowly, and that the storage period will be at least 60 days.

* An address, delivered by Dr. Parker, at the Annual Convention of the National Fertilizer Association, Hot Springs, Va., June 23, 1943.

In collaboration with the technical men of the major producers we have prepared the following general recommendations on the use of ammonia solutions. These recommendations represent standard rates of ammoniation under average conditions. Many operators use substantially higher rates, especially where there are facilities for reducing storage temperatures or where the storage period is relative short. Some operators normally use somewhat less than the indicated quantities, particularly during the summer and early fall months. Superphosphates differ considerably in the degree of reversion obtained with given ammoniation and storage conditions, so that, to a considerable extent, optimum rates must be established by each operator.

Storage Properties of Ammonium Nitrate

Ammonium nitrate fertilizer compound can be produced in a variety of forms that vary widely with regard to certain physical properties. Unfortunately, the first ammonium nitrate used in eastern United States during the past season was in poor physical condition and was difficult to use in mixed fertilizers or

TABLE 2
CRUSHING STRENGTH OF AMMONIUM NITRATE
BRIQUETTES

Ammonium Nitrate	Conditioner	Crushing Strength lbs. per sq. in.
Fine crystals.....	None	374
Fine crystals.....	Limestone 6%	342
Fine crystals.....	Kaolin 6%	136
Fine crystals.....	Kieselguhr 6%	140
4-16 mesh granules.....	Kaolin 2%	19

for direct application. It should be remembered that the product was not originally intended for fertilizer and no effort had been made to modify it for use as a fertilizer.

The tendency of ammonium nitrate to cake on storage is one of its objectionable properties. Experiments, therefore, have been conducted to determine how caking may be reduced. The materials indicated in Table 2 were subjected to accelerated caking tests which involved subjecting a small sample to a pressure of 12 pounds per sq. in. for seven days at a temperature of 86°F. The pressure required to crush the resulting briquette was determined.

The fine crystals of Canadian ammonium nitrate formed a very hard cake and the use of limestone as a conditioning agent did not reduce caking. The use of kaolin or kieselguhr, on the other hand, materially reduced caking. Granulation of the ammonium nitrate followed by coating with a good conditioning agent largely prevents caking in short time

experiments. It remains to be determined how such products will hold up on prolonged storage under a variety of conditions.

At the request of the War Production Board, various producers and the U. S. Department of Agriculture have exchanged information regarding processes and research findings. This has been mutually helpful and has resulted in rapid progress in product improvement.

The status of ammonium nitrate product improvement, and production, as of June 18, is as follows:

1. Hercules Powder Company is producing in California a finely grained ammonium nitrate with kieselguhr as the coating or conditioning agent. The product does not cake readily and has been satisfactory for West Coast conditions.

2. One Canadian plant has modified its crystallization process so that it produces crystals that are 20-30 times as large as those formerly produced and shipped to the United States. Kieselguhr has been substituted for limestone as the conditioning agent. This plant is in full-scale operation.

The Canadian plants have produced on pilot plant scale three types of granular ammonium nitrate. The most promising process is granulation by spraying an ammonium nitrate melt. The resulting granules are then coated with kieselguhr or kaolin to further prevent caking. It is expected that one Canadian plant will be in production on this granular product about July 1.

3. TVA has produced a coarse-grained ammonium nitrate containing 5 per cent limestone. It is expected that their product will be improved by the use of an improved anti-caking agent such as kaolin.

It is our opinion that any of the foregoing materials are satisfactory for use in mixed fertilizers and that the granular material from Canada and the TVA product are quite satisfactory for direct application. None of the materials, however, have been subjected to long-time storage tests, so no assurance can be given as to the degree of caking that may be experienced on storage.

Ammonium Nitrate and the Hygroscopicity of Mixed Fertilizers

Problems relating to the hygroscopicity of mixed fertilizers are not new to the industry. Keenen¹ determined the hygroscopicity of sixty-one commercial fertilizers and found extremely wide variations in their hygroscopic

¹ Report of Ammonia Department, E. I. du Pont de Nemours & Co., Wilmington, Del.

(Continued on page 24)

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Large Production of Winter Vegetables Requested

The War Food Administration has requested that the production of fall and early winter vegetables be maintained at the high level of the past two seasons. The request is made at this time in order to give growers time to plan their acreages in accordance with prospective needs. The principal areas affected are southern California, Arizona, Texas, and Florida.

Some shifts in production of individual items are suggested in order to emphasize urgently needed crops. Growers are asked to give preference to the production of potatoes and also to cabbage, kale, spinach and other green, leafy vegetables. A larger production of winter potatoes is desirable to supplement the supply which will be placed in storage this fall for consumption during the winter and spring. Increased production of certain other winter vegetables will be needed to supplement the supply of canned vegetables.

The War Food Administration will give assistance in obtaining necessary labor, machinery, fertilizers, seed, containers, and in securing transportation. In allocating available supplies of limited materials and facilities preference will be given to potatoes, cabbage, kale, spinach, and other green, leafy vegetables.

It now appears that the supply of fiber and wood containers will be limited. Such items as cabbage and potatoes can be shipped with a minimum use of fiber and wood containers. It is unlikely that quantities of wood and fiber containers for all winter vegetable crops can be increased above the quantities used during the past season. Therefore, growers of celery, lettuce, escarole and cauliflower, which require a large volume of wooden containers, are advised to keep their acreage below 80 per cent of the 1942 level.

The War Food Administration and the Office of Price Administration are reexamining ceiling prices for winter vegetables with a view to permitting adequate returns to growers of important winter vegetables while at the same time avoiding the type of speculative increases in prices which developed in some vegetable prices during the past season. Growers are therefore cautioned against placing too much emphasis upon speculative prices obtained during the past season for particular items in making their plans for the coming season.

WFA Modifies AAA Program

To encourage maximum food production in the face of the weather handicaps of a late and wet spring, the War Food Administration has decided to relax the provisions of the Agricultural Conservation program which prescribe deductions in AAA payments to farmers who fail to plant at least 90 per cent of their war crop goals.

The changes provide that in areas where hay and pasture goals have been established, and in the high plains area of Texas and Oklahoma, the deductions will apply only to farms on which the county AAA committee decides that abnormal weather conditions have not interfered with achieving the farm's war crop goal. (Hay and pasture goals have been established in the North Central and Western AAA regions, in Delaware, in the commercial corn producing areas of Maryland, Kentucky, Pennsylvania, and in the high plains area of Texas and Oklahoma.) On other farms in those designated areas and on all farms throughout the rest of the country, the deductions no longer will apply.

War Food Administration officials said that the action is designed to help offset recent unfavorable weather conditions. They pointed out that the floods in the Midwest have seriously upset the cropping programs which farmers in that area had planned for 1943; that spring planting has also been delayed by wet and cool weather over large sections of the East; and that drought conditions have prevailed in some Western areas.

WFA officials added that because of the late season it will be impossible to get as large an acreage of corn matured as was anticipated some weeks ago. Therefore, they are urging farmers in all areas to plant the emergency feed crops adapted to their conditions and needed to carry out their individual livestock programs. In the Great Plains States, and especially in areas where drought conditions have prevailed, it is extremely important to plant as large an acreage as possible of grain sorghums and other feed crops, and at the same time to guard against practices which are likely to cause severe wind erosion.

Wherever practicable, officials said, acreages in excess of present goals should be planted to flax, soybeans, peanuts, dry beans and peas, potatoes, sugar beets, and canning crops.

Officials said that with added flexibility provided in the areas where hay and pasture goals are established and complete elimination of the deduction provision in the other areas,

farmers throughout the nation are free to make such adjustments as are necessary to plant the needed crops adapted to their changed conditions and still qualify for such payments as are available.

Industry Committee Makes Nitrogen Recommendations

At the June 18th meeting of the Fertilizer Industry Advisory Committee, the subcommittee on inorganic nitrogen made a report pointing out that the estimated total visible supply of nitrogen, not including such Chilean nitrate of soda as may be imported, is about 520,000 tons N, and the revised estimated minimum need is about 675,000 tons of inorganic nitrogen. About 40 per cent of the supply is in the form of solutions or solid ammonium nitrate, which must be used currently as they are produced. The subcommittee recommended: (1) That mixers be encouraged to install ammoniating equipment, and to this end receive all necessary cooperation. (2) That superphosphate producers, where possible, make provision for producing ammoniated base for customers who find it impracticable or impossible to provide their own ammoniating equipment. (3) That for the present solid ammonium nitrate may be used without restriction for mixing or direct application. (4) That all ammonium nitrate, as well as all other forms of inorganic nitrogen, regardless of source, be subject to allocation by WPB. (5) That provision be made in the immediate future for the importation of a million tons of Chilean nitrate of soda. (6) That the Government and the industry coordinate their efforts for the distribution of inorganic nitrogen—the Government through clarity and definiteness in outlining its program and timeliness in submitting it, and through effective communication of its desires to the industry; and the industry through acceptance of the responsibility with the will to do the work.

Following the meeting, WFA reported, after conference with interested WPB officials, that: Recommendations 2, 3, 4, 5 are accepted without reservation or qualification. Recommendation 1 cannot be accepted, primarily because it involves the allocation of scarce materials which are not under the control of WFA or the directly interested groups in WPB. WFA accepted its responsibilities under number 6.

Chilean Nitrate Publishes New Minor Elements Supplement

The Chilean Nitrate Educational Bureau, Inc., announces publication of the 4th Supplement to the 3rd Edition of the "Bibliography of References to the Literature on the Minor Elements and Their Relation to Plant and Animal Nutrition," (originally compiled by L. G. Willis).

The First Edition of this Bibliography was published in August 1935, the Second in November 1936, and the Third, the last complete edition, in February, 1939. Subsequently the First Supplement was published in April, 1940, the Second in April, 1941 and the Third in May, 1942.

The latest publication in this series, the 4th Supplement contains about 94 pages and 690 abstracts, which include 110 crops and 30 elements. There are 887 authors listed. Complete indices are provided, including an element index, a botanical index and an author index which includes the names of all authors listed in the various abstracts.

Potash Production at Peak

The sales of potash salts of American manufacture during the production year from June 1, 1942 to May 31, 1943 totaled 690,480 tons of K_2O . This is the highest output in the history of the American potash industry and is more than double that of 1938, the last year prior to the present World War.

As in the past, over 90 per cent of the sales were for agricultural purposes, the tonnage for these grades amounting to 623,184 tons of K_2O . The chemical industries used 67,296 tons of K_2O . Sales for the different types of salts were as follows: 60 per cent muriate, 548,025 tons of K_2O ; 50 per cent muriate, 43,254 tons; manure salts, 51,892 tons; sulphate, including sulphate of potash magnesia, 47,309 tons. Shipments were made

to 41 States, Canada, Cuba, Puerto Rico and Hawaii as follows:

Deliveries of Domestic Potash Salts
June, 1942 to May, 1943, incl.
In tons of 2,000 lb. KO

	Muriate	Manure	Sulphate	Total
	60 %	50 %	Salts	
Ala.....	19,785	1,507	2,136	45 23,473
Ark.....	5,035	1,925	2,303	..... 9,263
Calif.....	2,362	.....	.....	5,341 7,703
Colo.....	76	.....	.....	..... 76
Conn.....	3,371	180	.....	677 4,228
Del.....	3,529	151	42	246 3,968
D. C.....	67	.....	14	20 101
Fla.....	30,132	1,950	692	9,531 42,305
Ga.....	37,556	9,038	8,817	2,854 58,265
Idaho.....	25	.....	.....	..... 25
Ill.....	22,498	2,027	2,173	181 26,879
Ind.....	24,994	178	2,961	40 28,173
Iowa.....	686	.....	.....	..... 686
Ky.....	3,115	377	492	186 4,170
La.....	9,567	1,160	4,234	464 15,425
Maine.....	8,794	.....	.....	373 9,167
Md.....	33,747	1,792	324	2,497 38,360
Mass.....	11,103	205	216	347 11,871
Mich.....	7,679	128	26	..... 7,833
Minn.....	1,153	20	.....	..... 1,173
Miss.....	6,705	1,802	1,703	10 10,220
Mo.....	.....	160	221	5 386
Nev.....	1,040	.....	.....	..... 1,040
N. J.....	21,626	1,110	14	1 22,992
N. M.....	12	.....	.....	..... 12
N. Y.....	9,209	110	11	79 9,409
N. C.....	30,205	4,322	2,429	8,050 45,006
N. D.....	61	.....	.....	..... 61
Ohio.....	43,122	972	2,200	377 46,671
Okla.....	31	.....	.....	..... 31
Ore.....	784	130	.....	134 1,048
Pa.....	11,473	980	990	603 14,046
R. I.....	177	.....	.....	..... 177
S. C.....	27,694	6,575	4,607	1,946 40,822
Tenn.....	14,017	927	3,693	339 18,976
Tex.....	3,735	51	821	..... 4,607
Utah.....	.....	.....	.....	185 185
Vt.....	246	21	.....	9 276
Va.....	43,597	2,953	971	5,827 53,348
Wash.....	1,510	61	.....	26 1,597
W. Va.....	134	20	26	..... 180
Wisc.....	2,404	46	26	10 2,486
Canada.....	22,139	2,375	9,750	2,413 36,677
Cuba.....	2,428	591 3,019
Puerto Rico.....	5,214	471 5,685
Hawaii.....	9,518	1,560 11,078

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FERTILIZER MATERIALS MARKET

NEW YORK

Supplies of Chemical Nitrogen Adequate. Ammonium Nitrate Presents Manufacturing Problem to Mixers. More Potash Wanted by Fertilizer Manufacturers. Triple Superphosphate Promised for Northeastern Section.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, June 29, 1943.

Inorganic Ammonia

From present indications, there will be ample supplies of inorganic ammonia for fertilizer manufacturers during the coming season. Unfortunately, a considerable portion of this material will be in the form of ammonium nitrate and it is now indicated that there will even be an increase in the tonnage of this material available over and above the original large tonnage expected. Fertilizer manufacturers are balking somewhat in accepting their allocations of this material as the handling of same is expected to be considerably more difficult than would be the handling of sulphate of ammonia in mixing operations. In fact, certain fertilizer manufacturers who have made definite test runs have advised that their manufacturing program is slowed up tremendously when using ammonium nitrate in mixing.

Potash

Fertilizer manufacturers have looked their potash for the second period of the new season on the basis of allocations received but there is much dissatisfaction among many of the manufacturers and quite a few demands have been made for additional material for this period. As far as we know, no additional allocations have been made as yet, but many of the buyers are hopeful of receiving prompt responses to their requests.

Fish Meal

Fishing operations have now started on the East Coast but with the restrictions placed on the fishing boats, it cannot be anticipated that the catch will be any too good. Some sales of fish scrap have been made.

Sodium Nitrate

The July price for this material continues the same, with steady shipments being made against allocations. It is estimated that about

one million tons of Chilean nitrate was imported during the present fertilizer year but with the increase in supplies of ammonium nitrate, it is now a question as to what arrangements will be made for nitrate of soda importations for the new year.

Superphosphate

There has been verbal notification that a certain quantity of triple superphosphate would be available for the northeastern part of the United States for July-December but no definite written allocation has yet been granted. It is expected that there will be an increase in production of superphosphate in this country but the increase is dependent upon the availability of sulphuric acid. The demand for superphosphate is heavy with stocks low.

BALTIMORE

Spring Tonnage at High Level. Feed Market Taking all Organics. Acid Demand for Munitions Curtails Superphosphate Output.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, June 29, 1943.

The spring season has now drawn to a close, and it is figured that the volume shipped this year figures very favorably with last year's tonnage, in spite of the handicaps encountered earlier in the season in the way of unfavorable weather conditions and labor difficulties.

Ammoniates.—The trend is rapidly developing to chemical complete fertilizer through inability of manufacturers to secure ample supplies of organic ammoniates in competition with buyers in the feeding trade. Due to the prevailing high prices of livestock and poultry, there is an unprecedented demand for protein feeding material at prices considerably higher than the fertilizer ceiling, with the result there are practically no organic

(Continued on page 21)

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ammoniates offering on the market at the present time for fertilizer.

Sulphate of Ammonia.—Contracts have now been booked for the coming season's business, subject to allocation by the Government, and the tonnage obtainable for fertilizer purposes will probably be increased as compared with last year.

Nitrate of Soda.—The situation is unchanged, and any deficit in sulphate and liquid ammonia will probably be made up by increased allocations of nitrate of soda for fertilizer purposes.

Fish Scrap.—Fishing on the Chesapeake Bay will of necessity be on a curtailed basis this year, due to war restrictions, and it is anticipated that the entire catch of menhaden fish will be utilized for feeding purposes. The present ceiling price of 60 per cent fish meal is \$72.50 per ton, while 65 per cent grade is \$75.50 per ton.

Superphosphate.—Due to the heavy demand for sulphuric acid for national defense purposes, there has been no increase in the production of superphosphate. All manufacturers are firm at recently announced ceiling price of 64 cents per unit of available phosphoric acid for run-of-pile, in bulk, f.o.b. producers' works, Baltimore.

Potash.—There is nothing new in the situation, and shipments are now being made against contracts previously booked.

Bone Meal.—The market remains unchanged and both raw and steamed bone meal continue scarce and high in price, the nominal market being around \$50.00 per ton.

Bags.—Up to the present time there has been no change in Government regulations pertaining to the use of burlap bags for shipment of fertilizer, but in some quarters it is expected there is likely to be a revision in this respect permitting the use of new burlap bags where especially required by consumers.

CHARLESTON

Ammonium Nitrate Now Available for Mixtures. Organics Situation Unchanged. No Quotations on Nitrogenous.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, June 28, 1943.

Ammonium Nitrate.—The WPB now allows manufacturers to use their allocation in mixed fertilizers or to dispose of it to farmers for direct application.

Sulphate of Ammonia.—Contracts are now being made on a 12-month basis.

Dried Blood.—There is no change in this situation. Price still remains at \$5.38 per unit of ammonia (\$6.54 per unit N) f.o.b. Chicago.

Nitrate of Soda.—The price on this for July shipment will be the same as that for June.

Nitrogenous.—No producers are yet quoting for the new season.

Cottonseed Meal.—Offerings of the 8 per cent grade are only nominal, the Atlanta price being \$38.50.

Soybean Meal.—Priced at \$45.20, Atlanta.

PHILADELPHIA

Steady Demand for Future Materials. Organics Still Scarce. Potash Allocations Smaller than Expected.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, June 28, 1943.

Activity is now limited to a quiet, but steady, demand for materials for shipment during the fall and spring. This really means some work to the manufacturers, for all the necessary forms must be executed, then a search for the supplies of the materials allocated.

Ammoniates.—The higher analysis materials are still scarce, and while some of the lower grade products show up from time to time, these are not plentiful either.

Sulphate of Ammonia.—This material moves in a routine manner, being entirely allocated.

Manufacturers' Sales Agents for **DOMESTIC**

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Nitrate of Soda.—It is reported that some of this arrived just recently, and that it was the largest shipment in years. The product, of course, is still under allocation.

Superphosphate.—The scarcity of the triple grade features the market in this material. The regular grades seem to be moving in good volume.

Bone Meals.—Demand has slackened a little, but the supply is so scarce that anyone in need of bone still has a difficult time to secure it.

Potash.—Less of this was allocated to the fertilizer mixers, owing to the export demand by the Allies. Otherwise, it is reported that production is holding well.

CHICAGO

Fertilizer Organic Market at Standstill Awaiting Allotment Solution. Feed Market Hoping for Imported Tankage.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, June 28, 1943.

Still no change has occurred in the organic market, and trading remains at a standstill. Refusal of producers to offer material, owing to the unsettled ceiling and allotment situations, deadlocks the market. War is certainly what General Sherman called it as far as business in many fertilizer materials is concerned.

Some South American tankage is now hoped for and if this materializes, it will be some relief to the feed situation.

No change in ceiling prices: High grade ground fertilizer tankage, \$3.85 to \$4.00 (\$4.68 to \$4.86 per unit N) and 10 cents; standard grades crushed feeding tange, \$5.53 per unit ammonia (\$6.72 per unit N); blood, \$5.38 (\$6.54 per unit N); dry rendered tankage, \$1.21 per unit of protein, Chicago basis.

TENNESSEE PHOSPHATE

Rain Breaks June Drought. Much Ground Rock Going into Livestock Mineral Mixtures. Norton Joins C. A. P.

Exclusive Correspondence to "The American Fertilizer"

COLUMBIA, TENN., June 28, 1943.

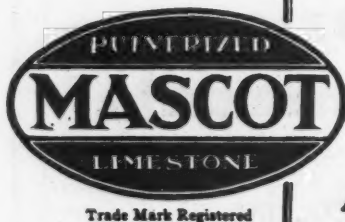
A hard general rain has temporarily broken a terrific June drought that seriously damaged crops and necessitated replanting of many tobacco fields.

Shipments proceed at a lively rate to all consuming channels. There has been a great increase in shipments to manufacturers of mineral mixtures for livestock who find it difficult to get bone products and even harder to pay the heavy advance in the cost of the same. Manufacturers who have used rock phosphate for twenty years, have known all along that the fluorine bugaboo cuts very little figure when the rock phosphate is properly used.

J. V. S. Norton, local manager of the International Minerals and Chemical Corp. has resigned, effective July 1st. He expects to work a few months in the Civil Aeronautical Patrol, being an accomplished pilot and much interested in this important adjunct. Until his successor is named, O. B. Cassell, of the Chicago office will be in charge.

American Potash and Chemical Corp. Awarded "E" Pennant

On June 23rd, the Army and Navy "E" Pennant was raised at the plant of the American Potash and Chemical Corporation, at Trona, California. The presentations of the Award Flag and of the Award Pins to the employees were made by Major C. W. Clark, U. S. A., and by Lt. Com. Churchill Cormalt, U. S. N. R. Speeches of acceptance were made by F. C. Baker, president of the Com-



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pany, and by three of the working force, Harry W. McNeil, Byrle F. Klein and Mrs. Johnnie H. Lewis. Production of potash salts, borax and other essential chemicals has been kept at peak figures since the beginning of the war and the entire personnel of the Company is determined that each six months shall see a new star added to the pennant for continued high production.

PROBLEMS IN FORMULATING FERTILIZERS FOR 1943-44

(Continued from page 13)

properties when exposed to different humidities for ten days as indicated in Table 3.

A number of rather hygroscopic materials—sodium nitrate, ammonium nitrate, urea, and sodium chloride (manure salts)—have been used by the industry for many years. Table 4 indicates the estimated quantity of these hygroscopic materials used in mixed

TABLE 3

PERCENTAGE MOISTURE ABSORBED BY COMMERCIAL FERTILIZERS

Number of Fertilizers	Relative Humidity			
	60%	65%	70%	75%
26	—1.1	1.5	2.4	8.6
22	0.3	5.2	7.2	18.2
13	2.2	13.4	15.2	24.0

TABLE 4

APPROXIMATE TONNAGE OF HYGROSCOPIC MATERIALS USED IN MIXED FERTILIZERS

(Short tons product)

	1929	1941	1942-43	1943-44
Nitrate of soda...	240,000	95,000	200,000	none
Ammonium nitrate	7,500	65,000	45,000	225,000
Urea.....	20,000	50,000	30,000	40,000
Sodium chloride*	280,000	46,000	110,000	115,000
Total.....	547,500	256,000	385,000	380,000

*From manure salts.

fertilizers in certain years with an estimate for 1943-44. The indicated tonnage of ammonium nitrate for 1943-44 is substantially greater than allocations to date. These data indicate that the tonnage of hygroscopic materials used in mixed fertilizers in 1943-44 will not be as great as in 1929 and approximately the same as in the past season. The chief difference between this season and next is the substitution of 180,000 tons of ammonium nitrate for 200,000 tons of nitrate of soda. Although these data show the overall picture, they leave several important points unanswered. One very important point is the relative influence of the four hygroscopic materials on the hygroscopicity of fertilizers.

Ammonium Nitrate and Moisture Absorption by Fertilizers

The absorption of moisture by a fertilizer is influenced by at least three factors:

1. The reactions that take place between the components of the fertilizer.
2. The hygroscopicity of the salt mixture.
3. The quantity of hygroscopic materials present.

Because there are considerable experimental data on these points, a brief consideration of them may be helpful.

Ammonium nitrate reacts with muriate of potash in a fertilizer to form ammonium chloride and potassium nitrate. After the reaction, ammonium nitrate no longer exists in the fertilizer unless it is added in excess, namely, more than a pound of ammonium nitrate per pound of muriate of potash. The hygroscopic properties of the fertilizer, therefore, are influenced by the content of ammonium chloride and potassium nitrate, not by ammonium nitrate. A similar reaction takes place between ammonium nitrate and potassium sulphate.

TABLE 5

RELATIVE HUMIDITY OF AIR IN EQUILIBRIUM WITH SATURATED SOLUTIONS OF SALT PAIRS AT 30 C.

	Ammonium Chloride	Potassium Nitrate	Urea
Potassium chloride.....	73.5	78.6	60.3
Ammonium sulphate.....	71.3	69.2	56.4
Mono-ammonium phosphate	74.4	59.9	65.2
Mono-calcium phosphate..	73.9	87.8	65.1
Ammonium nitrate.....	51.4	59.9	18.1
Urea.....	57.9	65.2	72.5
Sodium chloride.....	68.8	66.9	52.8
Sodium nitrate.....	51.9	64.5	45.6

Data on the hygroscopicity of several combinations of fertilizer materials are given in Table 5. These will be helpful in explaining several but not all observed facts about the absorption of water by fertilizers.

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See Page 4

A study of the table shows that potassium nitrate and mono-ammonium phosphate (59.9) is the most hygroscopic salt pair that would be present in a fertilizer formulated with superphosphate, muriate of potash, ammonium sulphate and ammonium nitrate. The addition of urea would give a slightly more hygroscopic mixture, ammonium chloride-urea (57.9). On the other hand the use of an excess of ammonium nitrate or of sodium nitrate would give combinations with ammonium chloride having values of 51.4 and 51.9, respectively.

The data also afford a good illustration of the importance of the reaction between ammonium nitrate and potassium chloride. Ammonium nitrate and urea form a very hygroscopic mixture, 18.1. On the other hand the most hygroscopic pair after the ammonium nitrate-potassium chloride reaction is ammonium chloride-urea, 57.9. This explains the successful use of urea and ammonium nitrate in mixed fertilizers. Since urea and sodium nitrate are more hygroscopic, 45.6, it explains the observed fact that in a fertilizer containing a known quantity of urea it is better to derive an additional unit of nitrogen from ammonium nitrate than from sodium nitrate.

The third important point influencing moisture absorption by fertilizers is the quantity of hygroscopic materials present in the mixture. A small quantity of material that will absorb moisture at a relative humidity of 50-60 per cent can be used in most fertilizers but the amount cannot be increased too much without experiencing some difficulty. One advantage of ammonium nitrate and urea is that, due to their high plant-food content, the quantity added to secure one or two units of nitrogen is relatively small. This tends to minimize the difficulties associated with their hygroscopic properties.

(To be continued in the next issue)

WARTIME WORK OF THE N. F. A.

(Continued from page 11)

industry and to agriculture as quickly and concisely as possible the various regulations issued affecting fertilizer production and distribution. Fertilizer War Notes are sent to all known members of the industry and to over 1000 agricultural workers throughout the Nation. The Association has continued its regular educational activities, distribution of pamphlets, and the showing of various moving picture films. We have sponsored the formation of a National Joint Committee on Nitrogen Utilization to study the post-war problem concerning nitrogen utilization.

In facing the coming year, we may as well realize that we shall be confronted with new and difficult problems. For the duration of the war our lot is apt to be harder rather than easier. We have endeavored in arranging our program to have explained to you our most important new situations by men best qualified to present them. We wish with all the emphasis at our command to express our very deep appreciation on behalf of the fertilizer industry for the most helpful and cooperative administrative attitude evidenced by the various war agency governmental officials dealing with our industry. We should also like to emphasize the fact that the understanding of mutual problems between Government and the fertilizer industry is increasing and that, in our opinion, the cooperative spirit is working towards a common goal.

This is strictly a business gathering, as all social functions ordinarily connected with our annual convention have been omitted. We believe by holding such a meeting we can best serve our country's interests; and, again, in behalf of the industry I repeat our pledge of wholehearted cooperation and effort to promote the vigorous prosecution of the war and prepare for the peace and rehabilitation problems that will follow.

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International Minerals & Chemical Corporation, Chicago, Ill.
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Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers

Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

PANS AND POTS

Stedman's Foundry and Mach. Works, Aurora, Ind.

PHOSPHATE MINING PLANTS

Chemical Construction Corp., New York City.

PHOSPHATE ROCK

American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Virginia-Carolina Chemical Corp. (Mining Dept.), Richmond, Va.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting

Duriron Co., Inc., The, Dayton, Ohio.

PIPES—Chemical Stoneware

Chemical Construction Corp., New York City.

PIPES—Wooden

Stedman's Foundry and Mach. Works, Aurora, Ind.

PLANT CONSTRUCTION—Fertilizer and Acid

Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers

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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers

American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
International Minerals & Chemical Corp., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS

Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting

Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers

Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Wellmann, William E., Baltimore, Md.

QUARTZ

Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

RINGS—Sulphuric Acid Tower

Chemical Construction Corp., New York City.

ROUGH AMMONIATES

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Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

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SCREENS

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SEPARATORS—Air

Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating

Sackett & Sons Co., The A. J., Baltimore, Md.

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Sackett & Sons Co., The A. J., Baltimore, Md.
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SHOVELS—Power

Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corporation, Chicago, Ill., and Cedar
Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers

Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS

Sackett & Sons Co., The A. J., Baltimore, Md.

SULPHATE OF AMMONIA

American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New
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Schmaltz, Jos. H., Chicago, Ill.
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Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.

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Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE

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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp.,
Tampa, Fla.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated

Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp.,
Tampa, Fla.

SYPHONS—For Acid

Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE

American Agricultural Chemical Co., New York City.

TANKAGE

American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Smith-Rowland, Norfolk, Va.
Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage

Huber & Company, New York City.

TANKS

Sackett & Sons Co., The A. J., Baltimore, Md.

TILE—Acid-Proof

Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption

Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

UNLOADERS—Car and Boat

Hayward Company, The, New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

UREA

DuPont de Nemours & Co., E. I., Wilmington, Del.

UREA-AMMONIA LIQUOR

DuPont de Nemours & Co., E. I., Wilmington, Del.

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Atlanta Utility Works, East Point, Ga.
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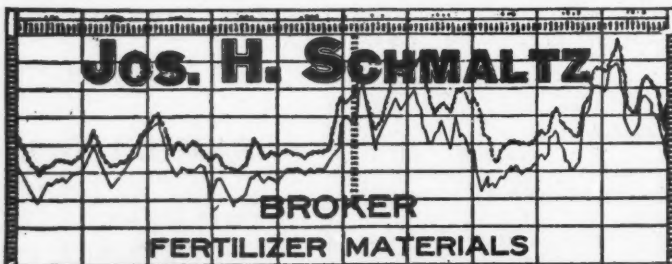
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Number 6 in a Series of Progress Reports
About Potash

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	Units of N-P ₂ O ₅ -K ₂ O
890 lbs. Superphosphate (18% P ₂ O ₅)	0 - 8 - 0
160 lbs. SOLUTION IV (37% N)	2.96 - 0 - 0
296 lbs. Sulphate of Ammonia (20.5% N)	3.04 - 0 - 0
654 lbs. Potash Salts, Conditioners, etc.	0 - 0 - 4
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